



- ☐ Tentative Specification
☐ Preliminary Specification
☒ Approval Specification

MODEL NO.: V315B5
SUFFIX:L10

Customer :

APPROVED BY

SIGNATURE

Name / Title

Note

Please return 1 copy for your confirmation with your signature and comments.

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**REVISION HISTORY**

Version	Date	Page (New)	Section	Description
Ver 2.0	Jul 11, 11' ,	All	All	Approval Specification was first issued.



1. GENERAL DESCRIPTION

1.1 OVERVIEW

V315B5- L10 is a 31.5" TFT Liquid Crystal Display module with 4U-type CCFL backlight unit and 1ch-LVDS interface. This module supports 1366 x 768 WXGA format and can display 16.7M (8-bit/color) colors. The T-balance board module for backlight is built-in.

1.2 FEATURES

- High brightness (450 nits)
- Ultra-high contrast ratio (3500:1)
- Fast response time (gray to gray average 8.5ms)
- Fast response time (8.5ms)
- High color saturation NTSC 72%
- HDTV (1366 x 768 pixels) resolution, WXGA format
- Ultra wide viewing angle : 176(H)/176(V)(CR≥20)with Super MVA technology
- DE (Data Enable) only mode
- LVDS (Low Voltage Differential Signaling) interface
- Optimized response time for 60Hz frame rate
- RoHs compliance
- Color reproduction (nature color)
- Low color shift function

1.3 APPLICATION

- TFT LCD TVs
- Multi-Media Display

1.4 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Active Area	697.6845 (H) x 392.256 (V) (31.51" diagonal)	mm	(1)
Bezel Opening Area	703.8 (H) x 399.0 (V)	mm	
Driver Element	a-si TFT active matrix	-	
Pixel Number	1366 x R.G.B. x 768	pixel	
Pixel Pitch (Sub Pixel)	0.17025(H) x 0.51075 (V)	mm	
Pixel Arrangement	RGB vertical stripe	-	
Power consumption	74	W	(2)
Display Colors	16.7M	color	
Display Operation Mode	Transmissive mode / Normally black	-	
Surface Treatment	Anti-Glare coating (Haze 11%),Hard coating (3H)	-	(3)

Note (1) Please refer to the attached drawings in sec 11 for more information about the front and back outlines.

Note (2) Please refer sec 3.1 and 3.2 for more information of Power consumption

Note (3) The spec. of the surface treatment is temporarily for this phase. CMI reserves the rights to change this feature.

**1.5 MECHANICAL SPECIFICATIONS**

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	759	760	761	mm	(1)
	Vertical(V)	449	450	451	mm	(1)
	Depth(D)	31.5	32.5	33.5	mm	(2)
	Depth(D)	53.8	54.8	55.8	mm	(3)
Weight			5219			g

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Note (2) Module Depth is between bezel to T-CON cover.

Note (3) Module Depth is between bezel to Inverter cover.



2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T _{ST}	-20	+60	°C	(1)
Operating Ambient Temperature	T _{OP}	0	+50	°C	(1), (2)
Shock (Non-Operating)	S _{NOP}	-	50	G	(3), (5)
Vibration (Non-Operating)	V _{NOP}	-	1.0	G	(4), (5)

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. ($T_a \leq 40\text{ }^{\circ}\text{C}$).

(b) Wet-bulb temperature should be 39 °C Max. ($T_a > 40\text{ }^{\circ}\text{C}$).

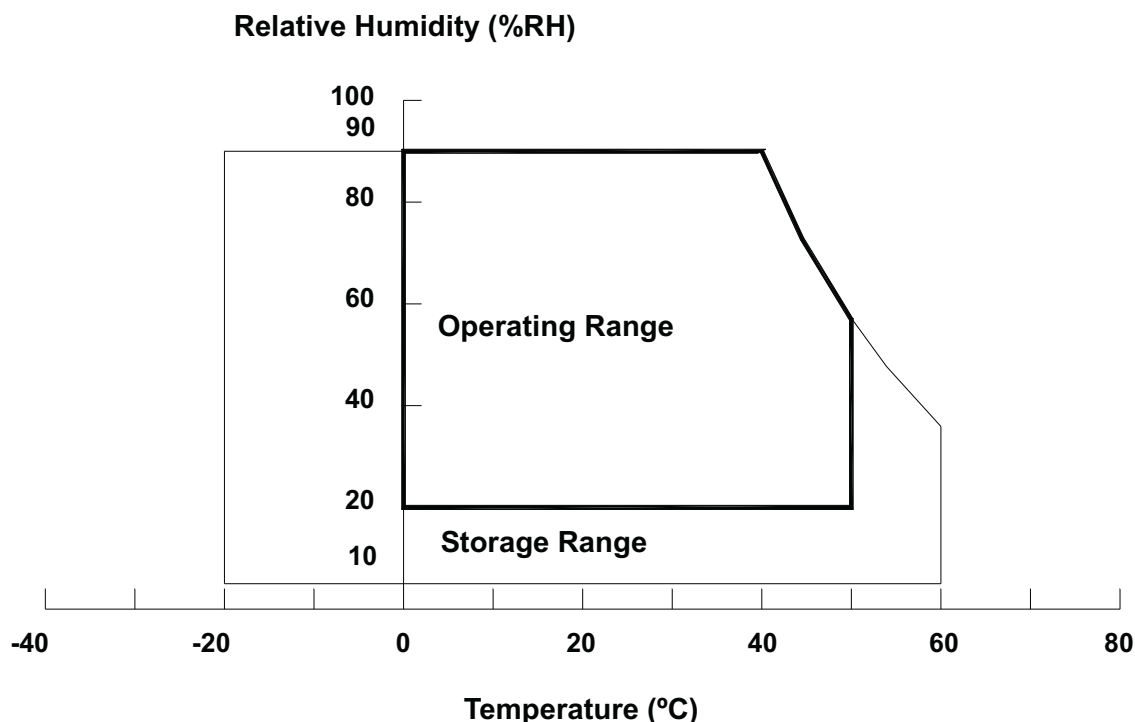
(c) No condensation.

Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 65 °C with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 65 °C. The range of operating temperature may degrade in case of improper thermal management in final product design.

Note (3) 11 ms, half sine wave, 1 time for $\pm X$, $\pm Y$, $\pm Z$.

Note (4) 10 ~ 200 Hz, 10 min, 1 time each X, Y, Z.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.





2.2 PACKING STORAGE

When storing modules as spares for a long time, the following precaution is necessary.

- (a) Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35℃ at normal humidity without condensation.
- (b) The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.

2.3 ELECTRICAL ABSOLUTE RATINGS

2.3.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	V _{CC}	-0.3	13.5	V	(1)
Input Signal Voltage	V _{IN}	-0.3	3.6	V	

2.3.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Lamp Voltage	V	—	3000	V _{RMS}	
Power Supply Voltage	High / Low	195 (Low)	390 (High)	V _{rms}	(1)
Control Signal Level	—	-0.3	15	V	(1), (3)

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Functional operation should be restricted to the conditions described under normal operating conditions.

Note (2) No moisture condensation or freezing.

Note (3) The control signals include On/Off Control, External PWM Control and DET_5V signal for inverter status output.

3. ELECTRICAL CHARACTERISTICS

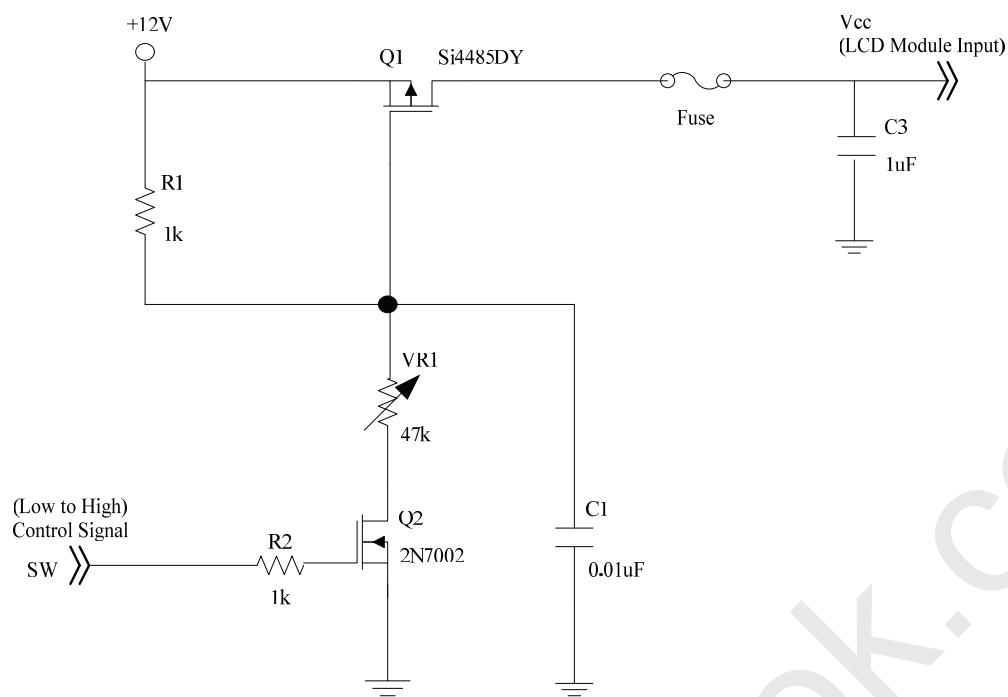
3.1 TFT LCD MODULE

 $T_a = 25 \pm 2\text{ }^{\circ}\text{C}$

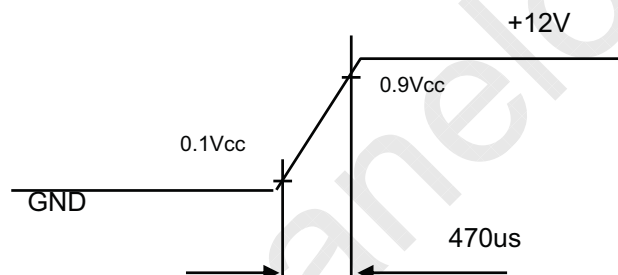
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V_{CC}	10.8	12	13.2	V	(1)
Rush Current		I_{RUSH}	-	-	2.8	A	
Power consumption	White Pattern	P_T		6.72	8.28	W	(2)
	Black Pattern	P_T		5.28	6.24	W	
	Horizontal Stripe	P_T	-	7.68	9.24	W	
Power Supply Current	White Pattern	-	-	0.56	0.69	A	(3)
	Black Pattern	-	-	0.44	0.52	A	
	Horizontal Stripe	-	-	0.64	0.77	A	
LVDS interface	Differential Input High Threshold Voltage	V_{LVTH}	+100	-	-	mV	(4)
	Differential Input Low Threshold Voltage	V_{LVTL}	-	-	-100	mV	
	Common Input Voltage	V_{CM}	1.0	1.2	1.4	V	
	Differential input voltage (single-end)	$ V_{ID} $	200	-	600	mV	
	Terminating Resistor	R_T	-	100	-	ohm	
CMOS interface	Input High Threshold Voltage	V_{IH}	2.7	-	3.3	V	
	Input Low Threshold Voltage	V_{IL}	0	-	0.7	V	

Note (1) The module should be always operated within above ranges.

Note (2) Measurement Conditions:



Vcc rising time is 470us



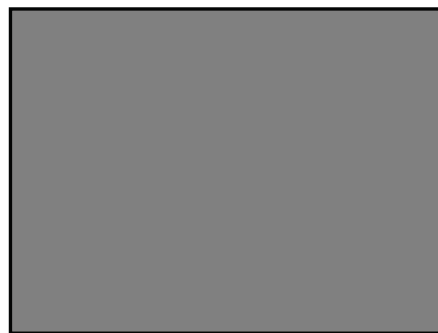
Note (3) The specified power supply current and power consumption is under the conditions at Vcc = 12 V, Ta = 25 ± 2 °C, f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern



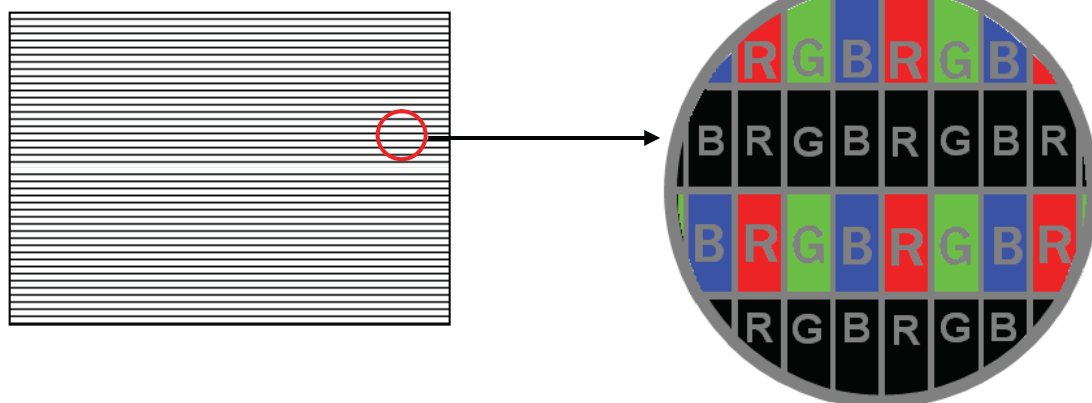
Active Area

b. Black Pattern

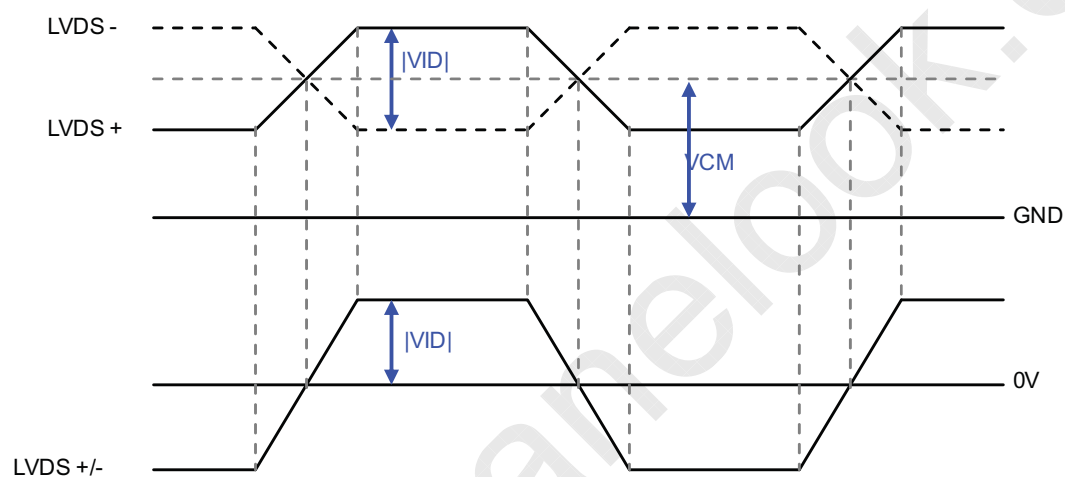


Active Area

c. Horizontal Pattern



Note (4) The LVDS input characteristics are as follows:



3.2 CCFL (Cold Cathode Fluorescent Lamp) CHARACTERISTICS

3.2.1 CCFL (Cold Cathode Fluorescent Lamp) CHARACTERISTICS (Ta = 25 ± 2 °C)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Input Voltage	V _L	-	1560	-	V _{RMS}	
Lamp Current	I _L	11.8	12.3	12.8	mA _{RMS}	(1)
Lamp Turn On Voltage	V _S	-	-	2710	V _{RMS}	Ta = 0 °C (2)
		-	-	2260	V _{RMS}	Ta = 25 °C (2)
Operating Frequency	F _L	40	-	80	KHz	(3)
Lamp Life Time	L _{BL}	50,000	-	-	Hrs	(4)

3.2.2 T-BALANCE BOARD CHARACTERISTICS (Ta = 25 ± 2 °C)

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Input High Voltage		High	380	390	400	Vrms	(6)
Input Low Voltage		Low	190	195	200	V	
Protection Circuit Supply Voltage		Vcc	11	13	15	V	
Power Consumption		P _{IP}	-	74	78	W	No Dimming (IPB input)
Input Current		I _{TB}		0.19	0.2	Arms	Measure TBB HIGH(390V)
Oscillating Frequency		F _W	61	63	65	kHz	
Individual Lamp Current		I _L	11.3	12.3	13.3	mA	(5)
Connector Detection	High	CNTPRT	Vcc-0.5	-	Vcc	V	Normal Operation
	Low	CNTPRT	-	-	1	V	Input Connector Open
All Lamp Open Detection	High	LD	Vcc-0.5	-	Vcc	V	Normal Operation
	Low	LD	-	-	1	V	All Lamp Open
One Lamp Open Detection	High	OVP	1.25	-	-	V	Normal Operation
	Low	OVP	0	-	0.8	V	One Lamp Open
Dimming frequency		F _B	140	150	160	Hz	
Minimum Duty Ratio		D _{MIN}	12	15	18	%	(8)
Striking time		tsriking	1	-	2	sec	
Shutdown time		Tsd	1	1.5	2	sec	

Note (1) Lamp current is measured by utilizing AC current probe and its value is average by measuring master and slave board.:

Note (2) The lamp starting voltage V_S should be applied to the lamp for more than 1 second after startup. Otherwise the lamp may not be turned on.

Note (3) The lamp frequency may produce interference with horizontal synchronous frequency of the display input signals, and it may result in line flow on the display. In order to avoid interference, the lamp frequency should be detached from the horizontal synchronous frequency and its harmonics

as far as possible.

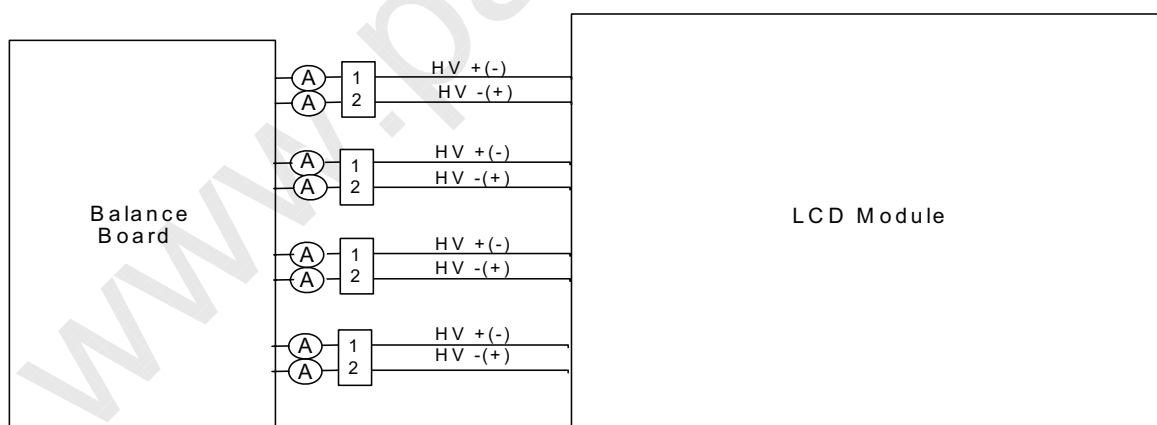
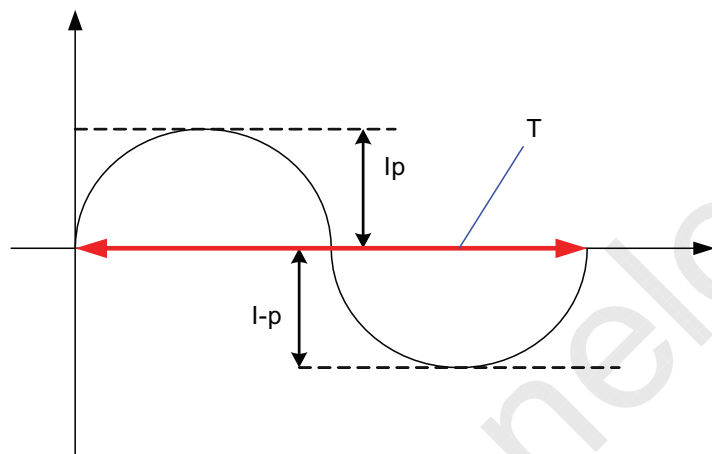
Note (4) The life time of a lamp is defined as when the brightness is larger than 50% of its original value and the effective discharge length is longer than 80% of its original length (Effective discharge length is defined as an area that has equal to or more than 70% brightness compared to the brightness at the center point of lamp.) as the time in which it continues to operate under the condition at $T_a = 25 \pm 2^\circ\text{C}$ and $I_L = 11.3 \sim 13.3 \text{ mArms}$.

Note (5) Lamp current is measured master board by utilizing high frequency current meters as shown below:

Note (6) Input voltage Hv based on spec. $\pm 7\%$ tolerance.

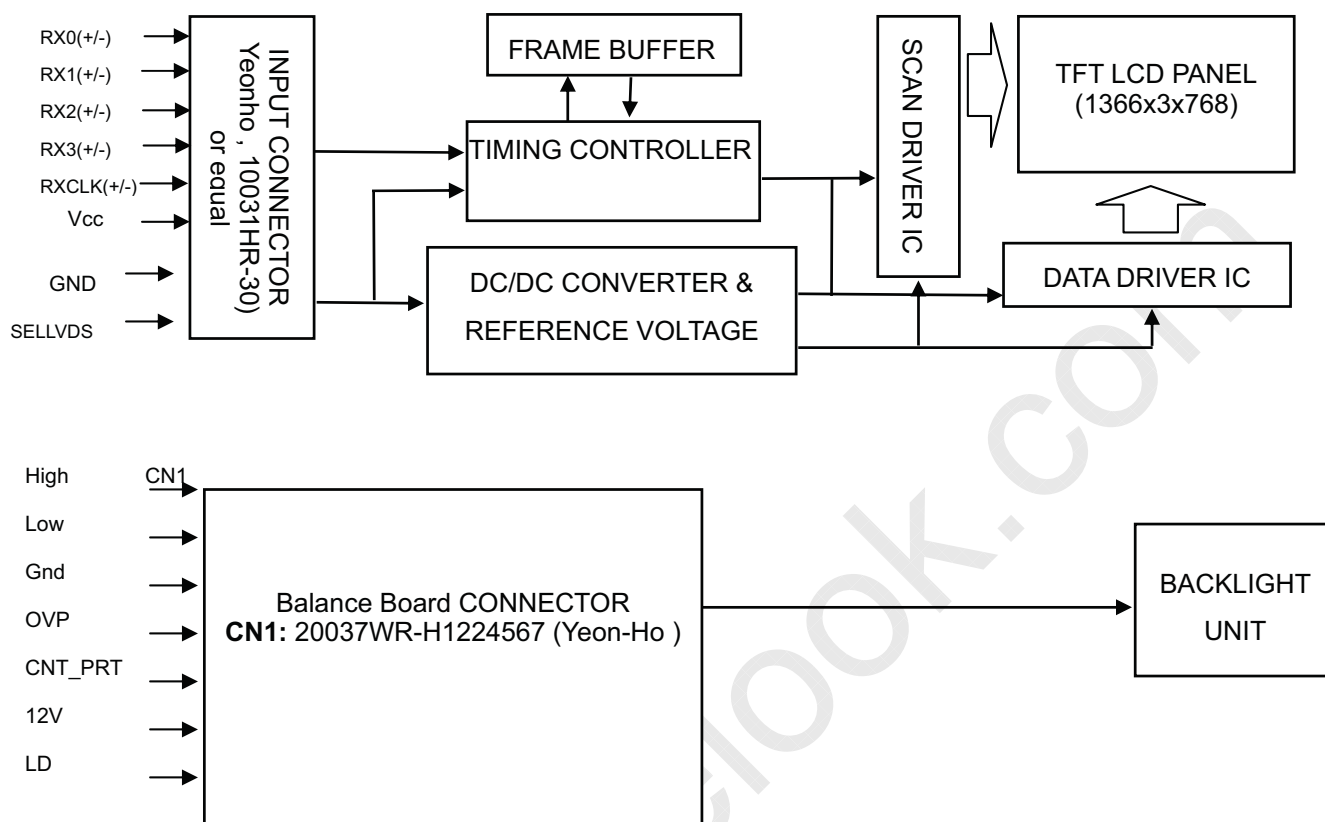
Note (7) Asymmetric ratio must be from 90% to 110% ($0.9 < I_p / I_{\text{rms}@T/2X\sqrt{2}} < 1.1$)

Note (8) The minimum dimming 0% operation should cause flicker by protection circuit.



4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



5. INTERFACE PIN CONNECTION

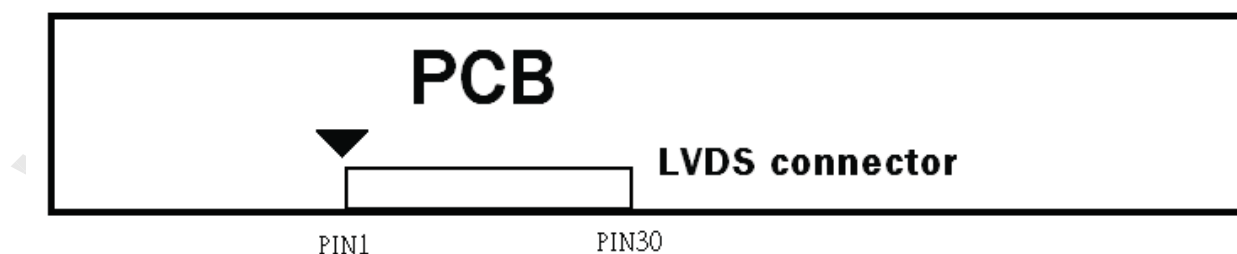
5.1 TFT LCD MODULE

CNF1 Connector Pin Assignment

Pin No.	Symbol	Description	Note
1	NC	No connection	(3)
2	SCL	EEPROM Serial Clock	
3	SDA	EEPROM Serial Data	
4	GND	Ground	
5	RX0-	Negative transmission data of pixel 0	
6	RX0+	Positive transmission data of pixel 0	
7	GND	Ground	
8	RX1-	Negative transmission data of pixel 1	
9	RX1+	Positive transmission data of pixel 1	
10	GND	Ground	
11	RX2-	Negative transmission data of pixel 2	
12	RX2+	Positive transmission data of pixel 2	
13	GND	Ground	
14	RXCLK-	Negative of clock	
15	RXCLK+	Positive of clock	
16	GND	Ground	
17	RX3-	Negative transmission data of pixel 3	
18	RX3+	Positive transmission data of pixel 3	
19	GND	Ground	
20	NC	No connection	(3)
21	SELLVDS	Select LVDS data format	(2)(4)
22	WP	EEPROM Write Protection	
23	GND	Ground	
24	GND	Ground	
25	GND	Ground	
26	VCC	Power supply: +12V	
27	VCC	Power supply: +12V	
28	VCC	Power supply: +12V	
29	VCC	Power supply: +12V	
30	VCC	Power supply: +12V	

Note (1) Connector type: 10031HR-30 (Yeonho) or compatible

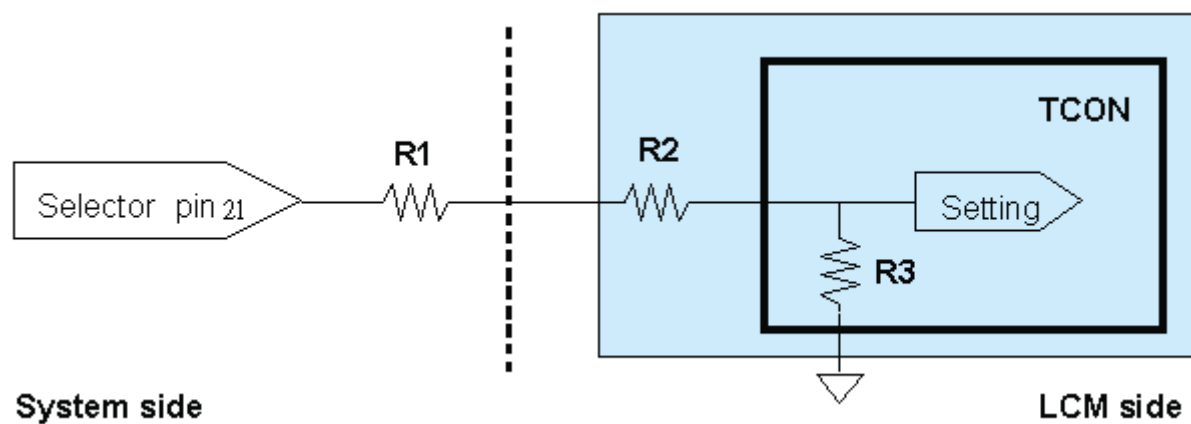
LVDS connector pin order defined as follows



Note (2) Low = Open or connect to GND: JEIDA Format, High = Connect to +3.3V: VESA Format.

Note (3) Reserved for internal use. Please leave it open.

Note (4) LVDS signal pin connected to the LCM side has the following diagram. R1 in the system side should be less than 1K Ohm. ($R1 < 1K \text{ Ohm}$)



5.2 BACKLIGHT UNIT

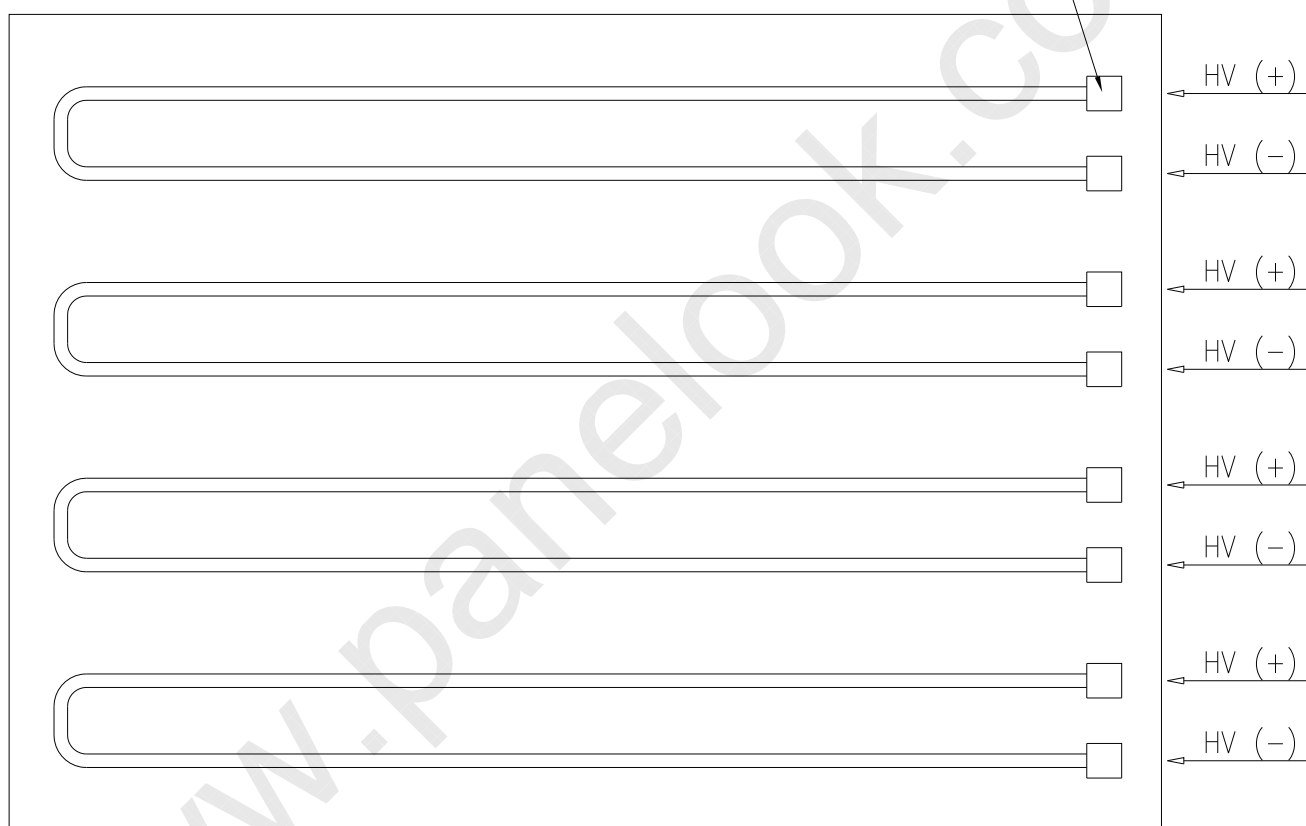
The pin configuration for the housing and leader wire is shown in the table below.

CN2-CN5 (Socket Connector): E01B-KCF or equivalent

Pin No.	Symbol	Description	Remark
1	HV	High Voltage	
	HV	High Voltage	

Note (1) The backlight interface housing for high voltage side is a model E01B-KCF, manufactured by JST or equivalent.

JST SOCKET CONNECTOR
E01B-KCF OR EQUIVALENT



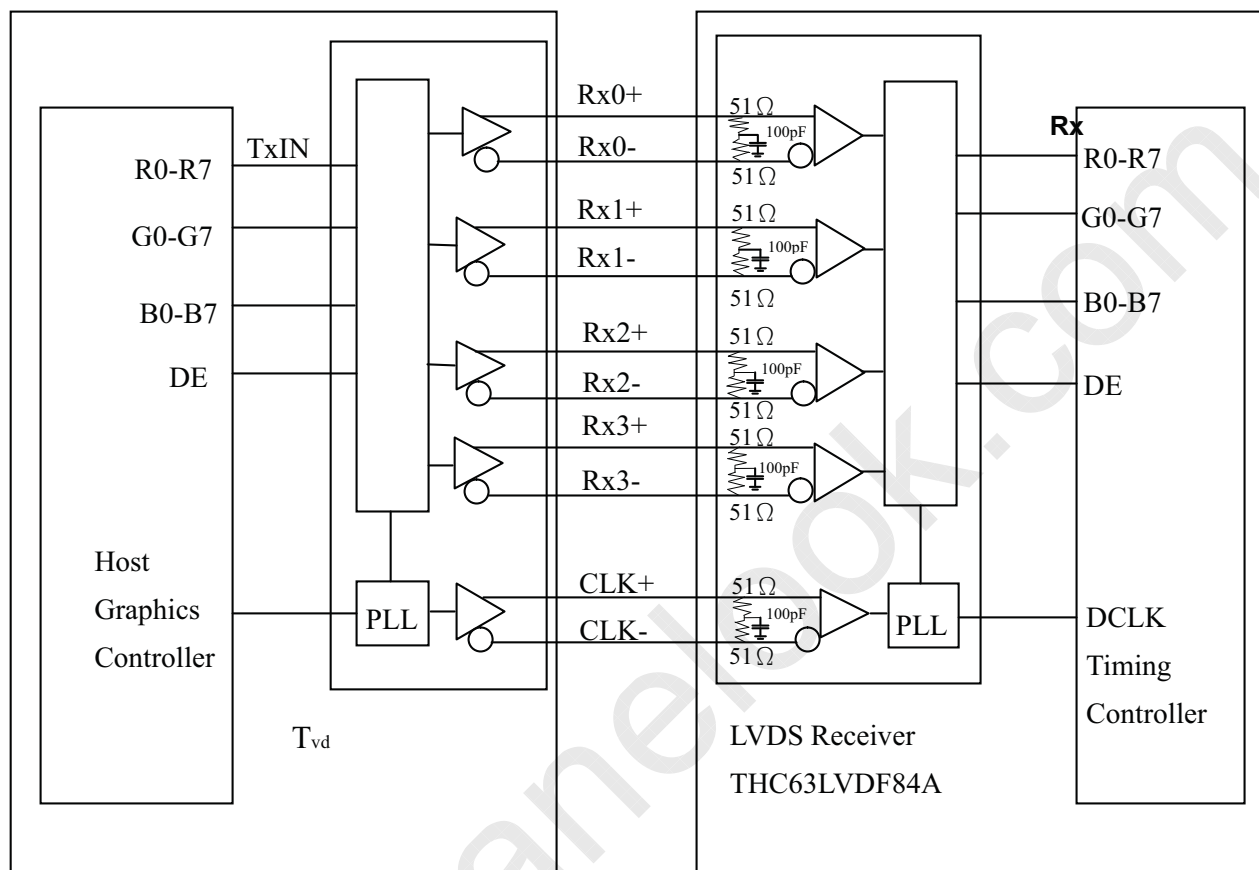
**5.3 T-BALANCE BOARD UNIT**

CN1(Header): 20037WR-H1224567(Yeon-Ho)

Pin №	Signal name	Feature
1	HIGH (FET)	Pulse 390V (Drive, Primary)
2	No pin	NC
3	LOW (FET)	Blocking (195Vdc, Primary)
4	No pin	NC
5	No pin	NC
6	No Pin	NC
7	No Pin	NC
8	GND	Ground (Secondary)
9	OVP	One Lamp Open Protection
10	CNT_PRT	Open Input Connector Protection (Normal 12V, Active Low)
11	12V	VCC
12	LD	All Lamp Open Protection (Normal 12V, Active Low)

5.4 BLOCK DIAGRAM OF INTERFACE

CNF1



R0~R7 : Pixel R Data

G0~G7 : Pixel G Data

B0~B7 : Pixel B Data

DE : Data Enable Signal

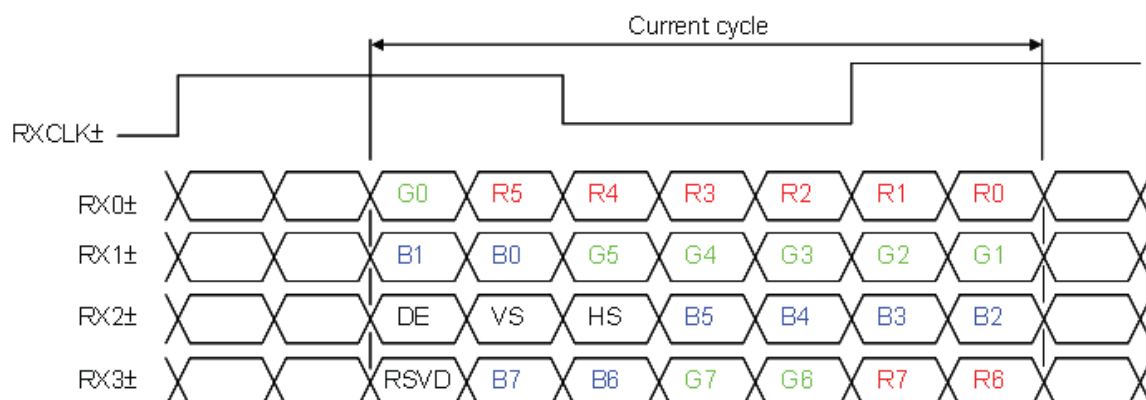
DCLK : Data clock signal

Note (1) The system must have the transmitter to drive the module.

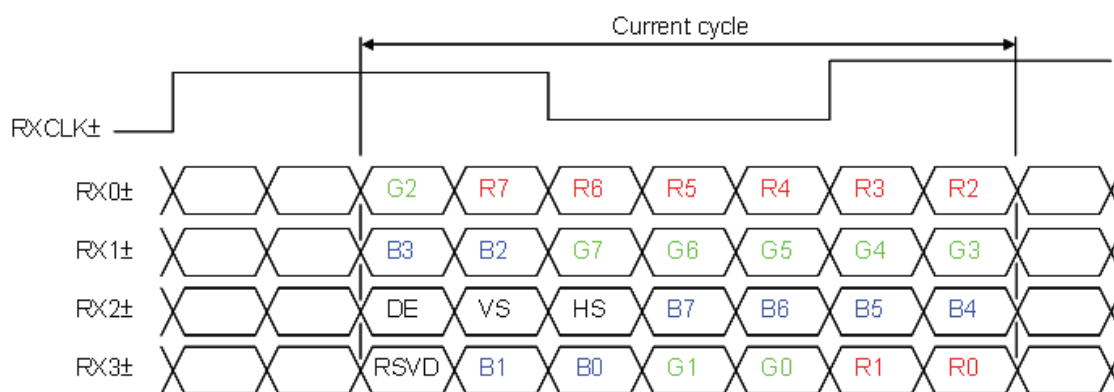
Note (2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is used differentially

5.5LVDS INTERFACE

VESA LVDS format : (SELLVDS pin=H)



JEIDA LVDS format : (SELLVDS pin= L or open)



R0~R7: Pixel R Data (7; MSB, 0; LSB)

G0~G7: Pixel G Data (7; MSB, 0; LSB)

B0~B7: Pixel B Data (7; MSB, 0; LSB)

DE: Data enable signal

Notes(1) RSVD(reserved)pins on the transmitter shall be "H" or("L" or OPEN)



5.6 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color.

The higher the binary input, the brighter the color. The table below provides the assignment of the color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
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	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
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	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

6. INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS (Ta = 25 ± 2 °C)

The input signal timing specifications are shown as the following table and timing diagram.

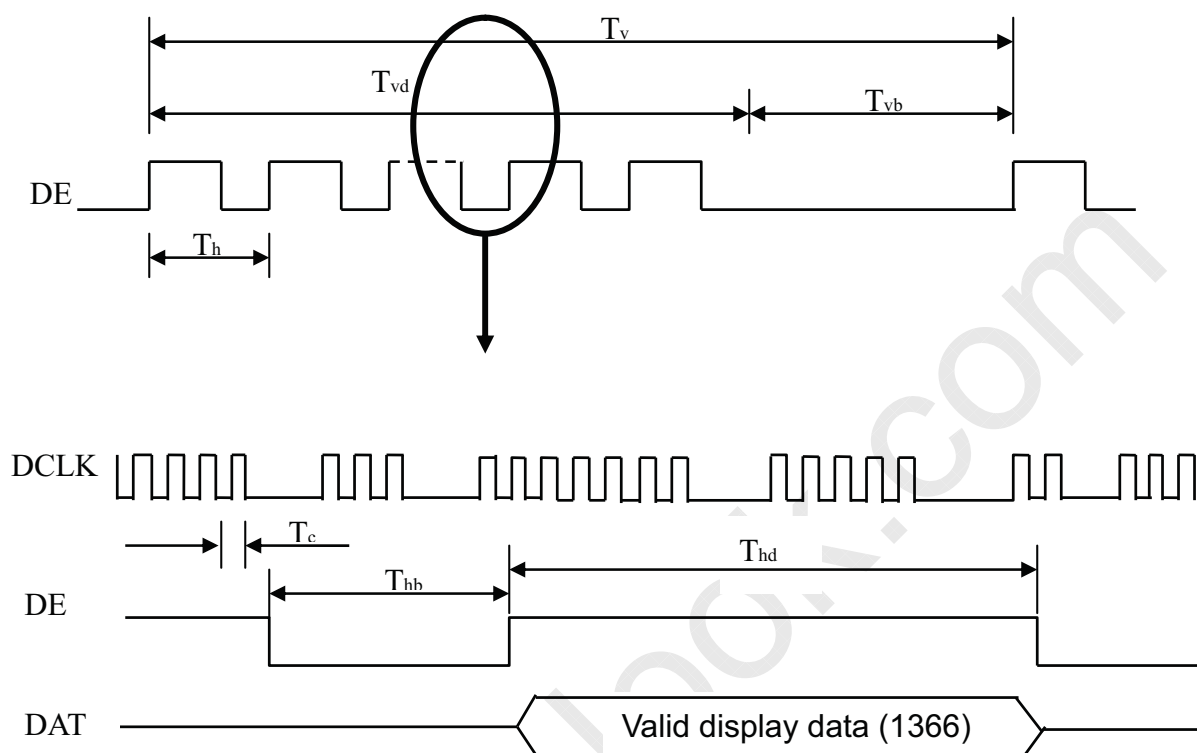
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Receiver Clock	Frequency	F_{clkin} (=1/TC)	60	76	82	MHz	
	Input cycle to cycle jitter	T_{rcl}	—	—	200	ps	(3)
	Spread spectrum modulation range	$F_{\text{clkin_mod}}$	$F_{\text{clkin}}-2\%$	—	$F_{\text{clkin}}+2\%$	MHz	(4)
	Spread spectrum modulation frequency	F_{SSM}			200	KHz	
LVDS Receiver Data	Setup Time	T_{lvsu}	600	—	—	ps	(5)
	Hold Time	T_{lvhd}	600	—	—	ps	
Vertical Active Display Term	Frame Rate	F_{r5}	47	50	53	Hz	
		F_{r6}	57	60	63	Hz	
	Total	T_{v}	776	806	1018	Th	$T_{\text{v}}=T_{\text{vd}}+T_{\text{vb}}$
	Display	T_{vd}	768	768	768	Th	—
	Blank	T_{vb}	8	38	250	Th	—
Horizontal Active Display Term	Total	T_{h}	1442	1560	2006	Tc	$T_{\text{h}}=T_{\text{hd}}+T_{\text{hb}}$
	Display	T_{hd}	1366	1366	1366	Tc	—
	Blank	T_{hb}	76	194	640	Tc	—

Note (1) Since the module is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this module would operate abnormally.

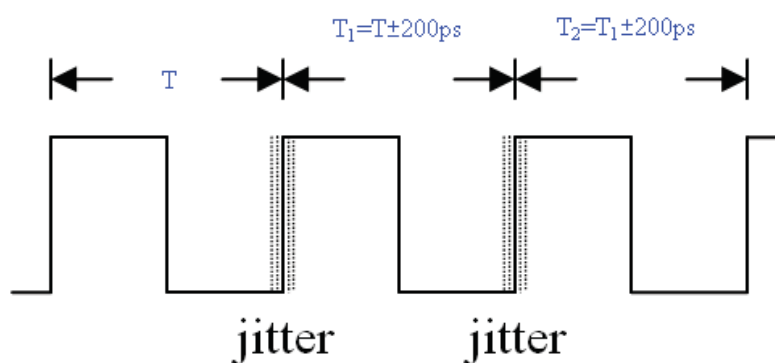
Note (2) Please make sure the range of pixel clock has follow the below equation :

$$F_{\text{clkin}}(\text{max}) \geq F_{\text{r6}} \times T_{\text{v}} \times T_{\text{h}}$$

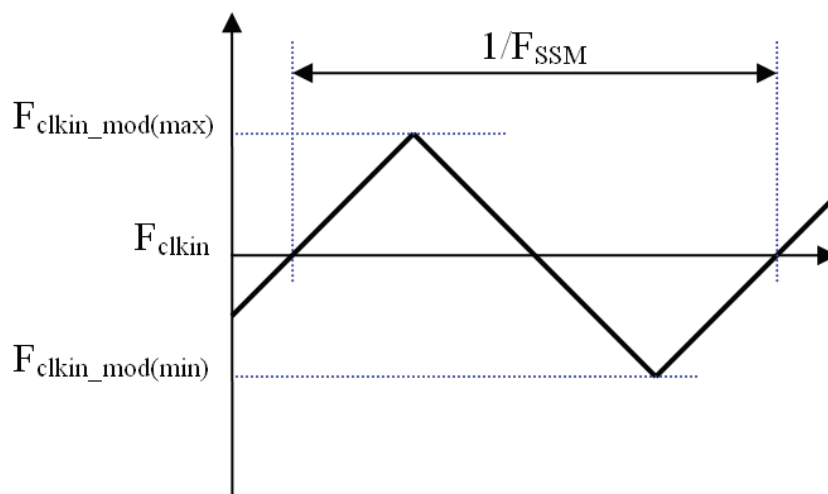
$$F_{\text{r5}} \times T_{\text{v}} \times T_{\text{h}} \geq F_{\text{clkin}}(\text{min})$$

INPUT SIGNAL TIMING DIAGRAM


Note (3) The input clock cycle-to-cycle jitter is defined as below figures. $Trcl = |T_1 - T_1|$

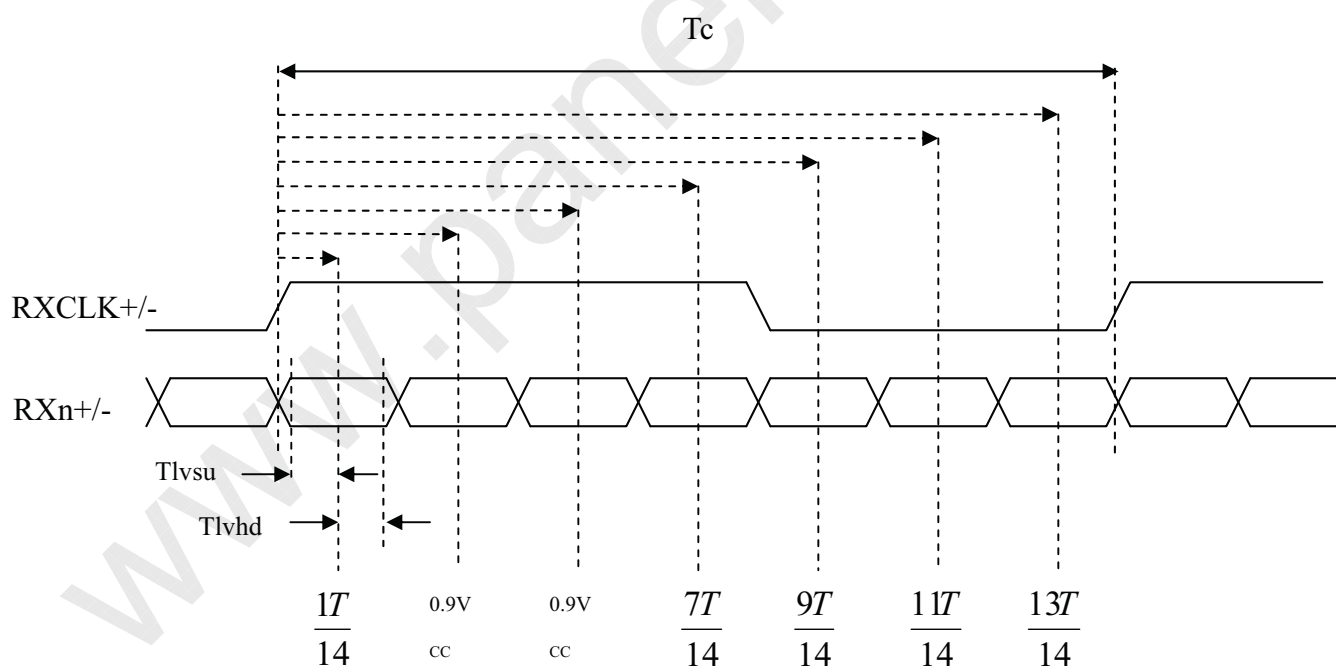


Note (4) The SSCG (Spread spectrum clock generator) is defined as below figures.



Note (5) The LVDS timing diagram and setup/hold time is defined and showing as the following figures.

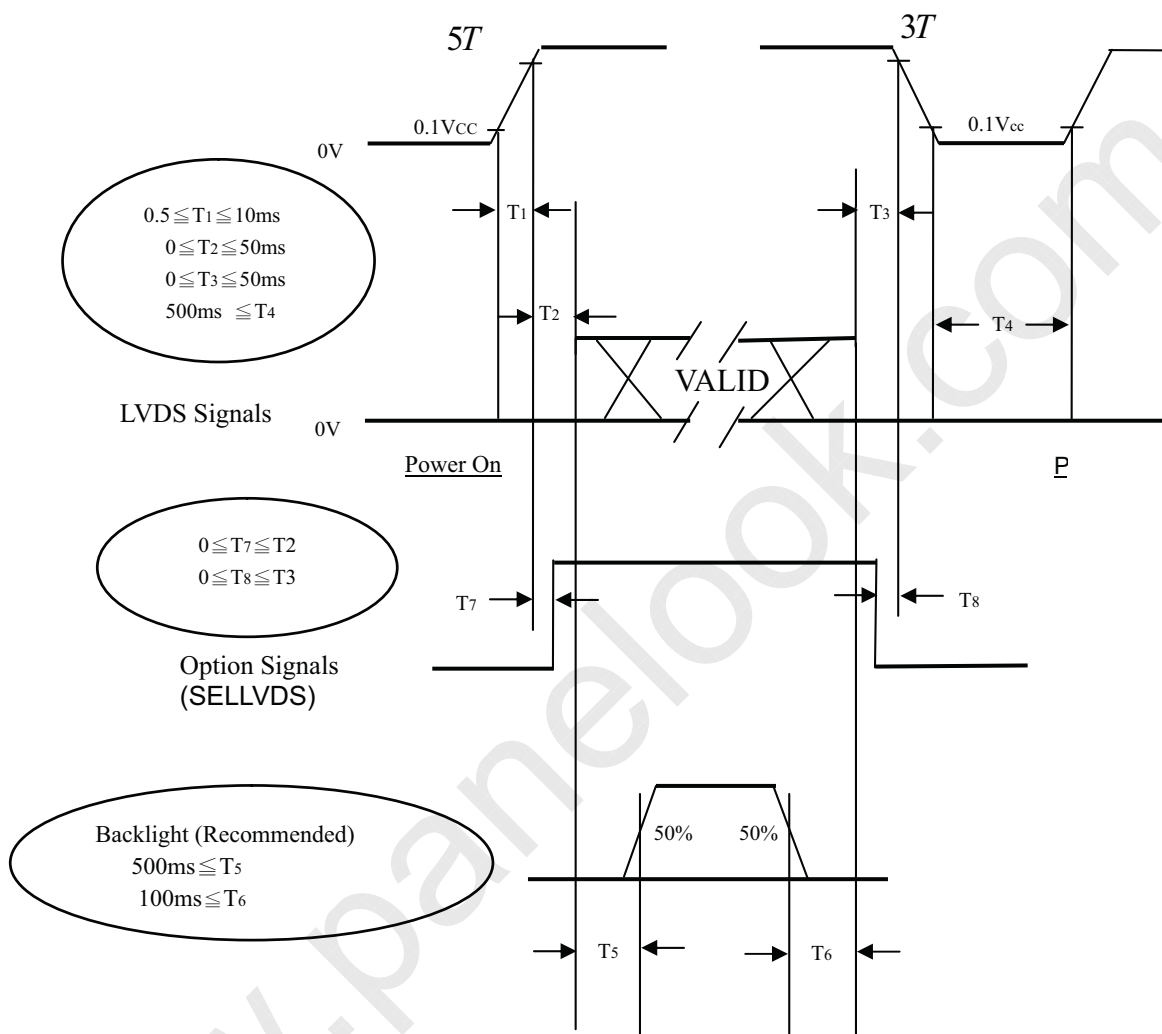
LVDS RECEIVER INTERFACE TIMING DIAGRAM



6.2 POWER ON/OFF SEQUENCE

($T_a = 25 \pm 2^\circ\text{C}$)

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should be as the diagram below.



Power ON/OFF Sequence

Note (1) The supply voltage of the external system for the module input should follow the definition of Vcc.

Note (2) Apply the lamp voltage within the LCD operation range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen.

Note (3) In case of Vcc is in off level, please keep the level of input signals on the low or high impedance. If $T_2 < 0$, that maybe cause electrical overstress failures.

Note (4) T_4 should be measured after the module has been fully discharged between power off and on period.

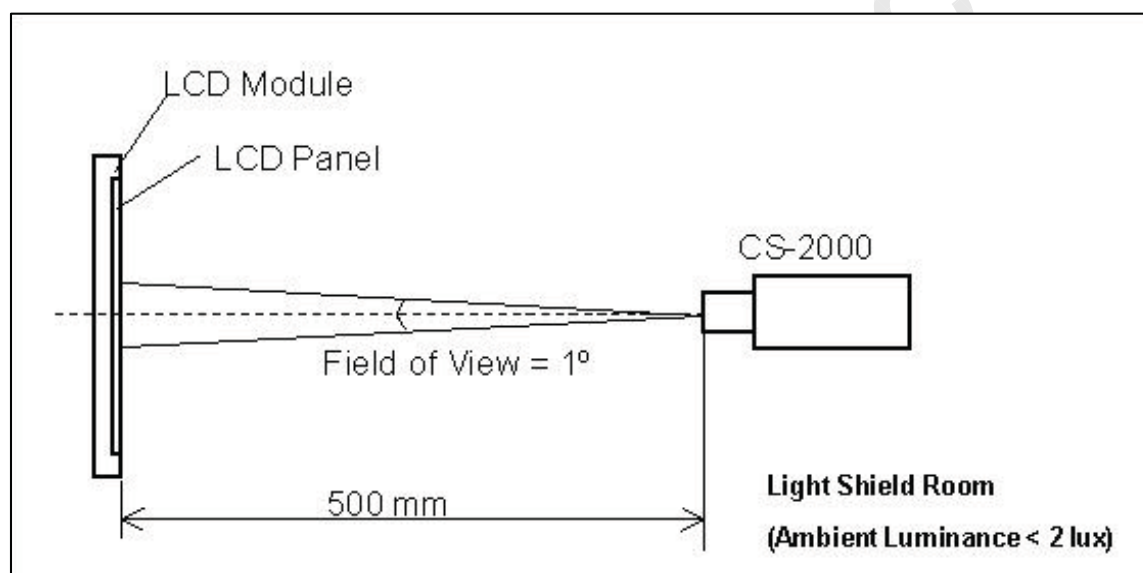
Note (5) Interface signal shall not be kept at high impedance when the power is on.

7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V _{CC}	12.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Lamp Current	I _L	12.3±0.5	mA
Oscillating Frequency (Inverter)	F _W	63±3	KHz
Frame rate	Fr	60	Hz

The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring in a windless room.



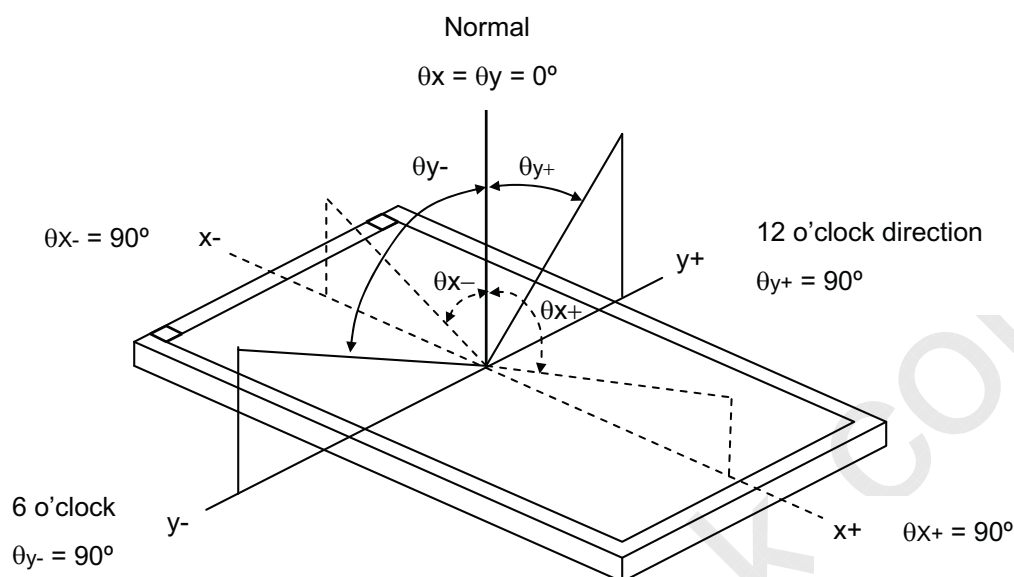
7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	$\theta_x=0^\circ, \theta_Y=0^\circ$ Viewing Angle at Normal Direction	2600	3500	-	-	(2)
Response Time		Gray to gray average			8.5		ms	(3)
Center Luminance of White		L _C		360	450	-	cd/m ²	(4)
White Variation		δW		-	-	1.3	-	(7)
Cross Talk		CT		-	-	4.0	%	(5)
Color Chromaticity	Red	R _x		Typ -0.03	0.646 0.330 0.274 0.599 0.143 0.069 0.280 0.288	Typ +0.03	-	(6)
		R _y					-	
	Green	G _x					-	
		G _y					-	
	Blue	B _x					-	
		B _y	-					
	White	W _x	-					
		W _y	-					
	Color Gamut		CG				72	
Viewing Angle	Horizontal	θ _x +	CR≥20	80	88	-	Deg.	(1)
		θ _x -		80	88	-		
	Vertical	θ _y +		80	88	-		
		θ _y -		80	88	-		

Note (1) Definition of Viewing Angle (θ_x , θ_y):

Viewing angles are measured by Autronic Conoscope Cono-80.



Note (2) Definition of Contrast Ratio (CR) :

The contrast ratio can be calculated by the following expression.

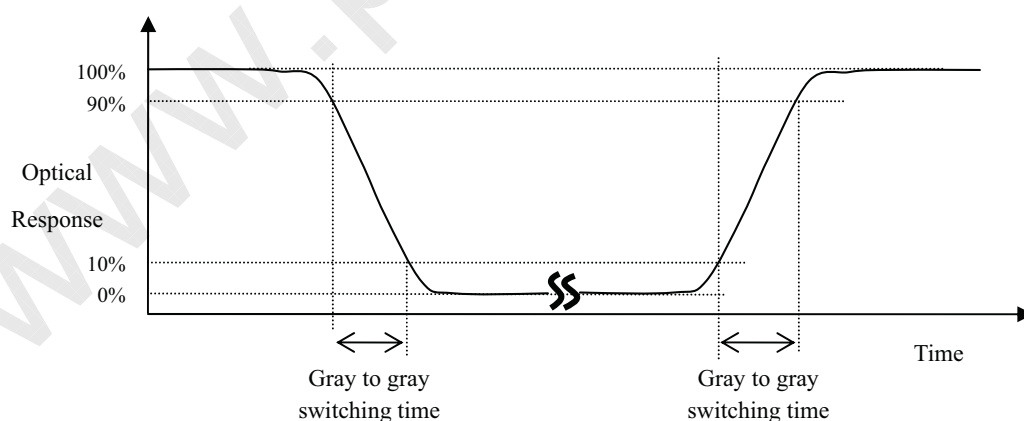
$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance of L255}}{\text{Surface Luminance of L0}}$$

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (6).

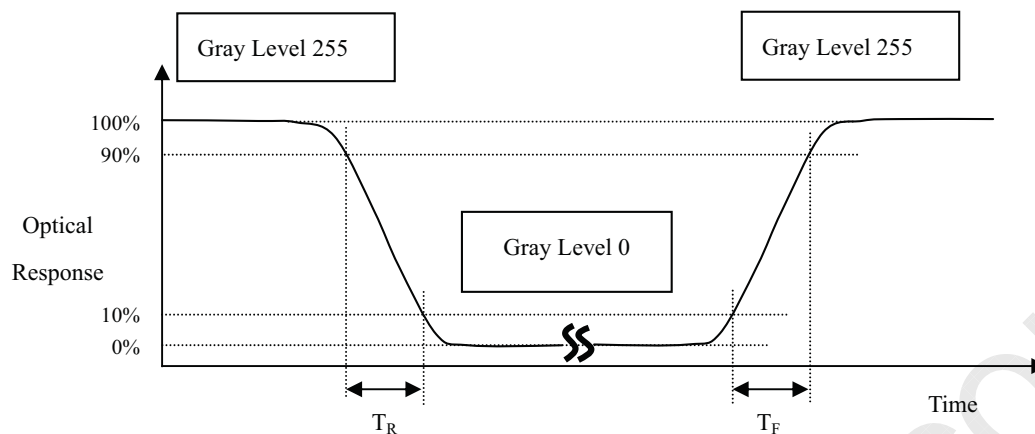
Note (3) Definition of Gray to Gray Switching Time :



The driving signal means the signal of gray level 0, 124, 252, 380, 508, 636, 764, 892 and 1023.

Gray to gray average time means the average switching time of gray level 0, 124, 252, 380, 508, 636, 764, 892 and 1023 to each other.

Note (4) Definition of Response Time (TR, TF):



Note (5) Definition of Luminance of White (L_C):

Measure the luminance of gray level 255 at center point and 5 points

$L_C = L(5)$, where $L(X)$ is corresponding to the luminance of the point X at the figure in Note (6).

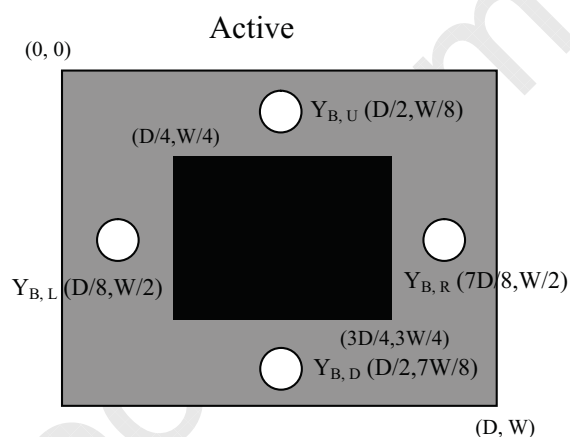
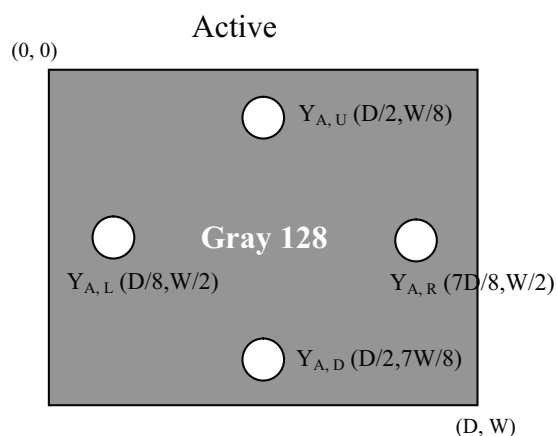
Note (6) Definition of Cross Talk (CT):

$$CT = |Y_B - Y_A| / Y_A \times 100 (\%)$$

Where:

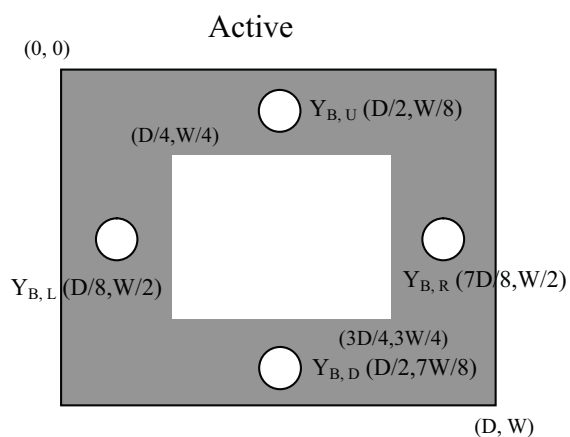
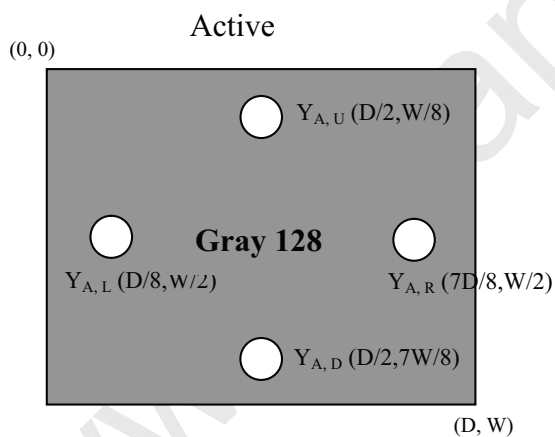
YA = Luminance of measured location without gray level 0 pattern (cd/m2)

YB = Luminance of measured location with gray level 0 pattern (cd/m2)



YA = Luminance of measured location without gray level 255 pattern (cd/m2)

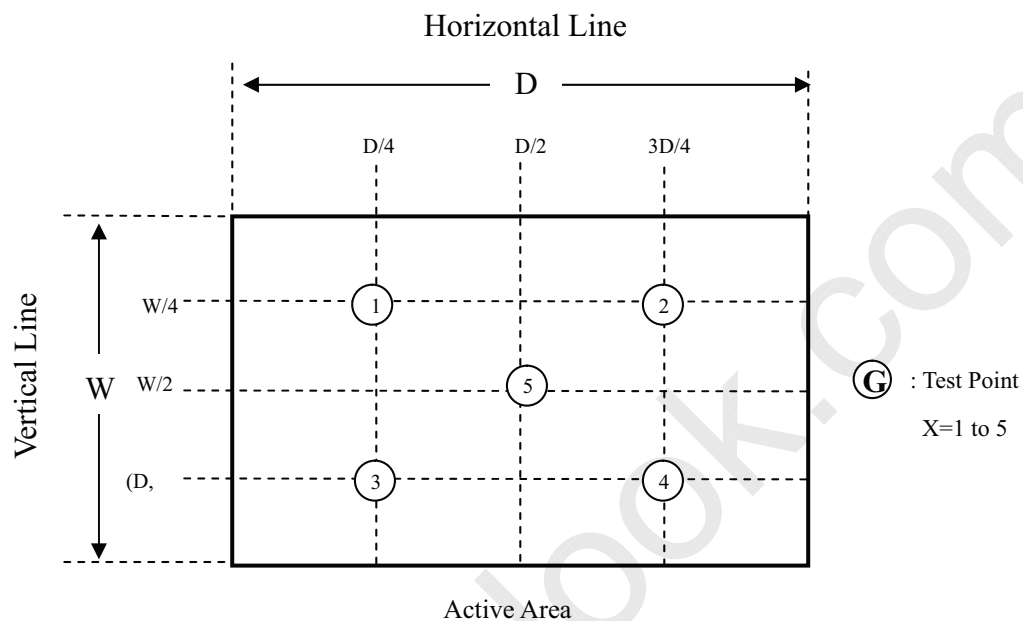
YB = Luminance of measured location with gray level 255 pattern (cd/m2)



Note (7) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

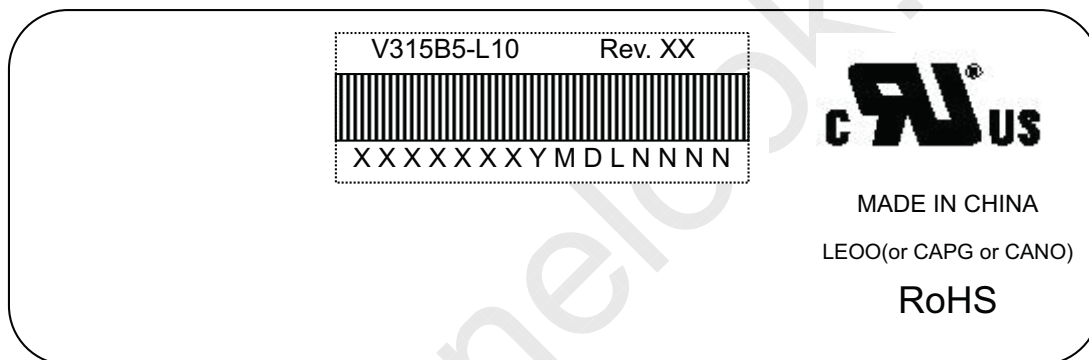
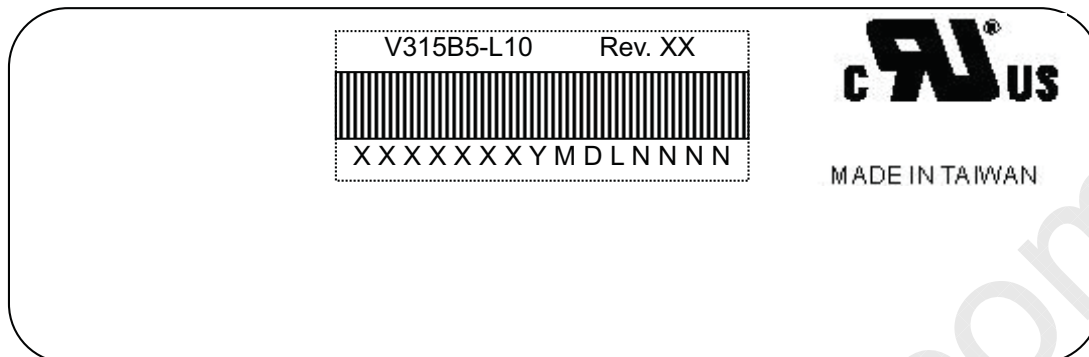
$$\delta W = \text{Maximum } [L(1), L(2), L(3), L(4), L(5)] / \text{Minimum } [L(1), L(2), L(3), L(4), L(5)]$$



8. DEFINITION OF LABELS

8.1 CMO MODULE LABEL

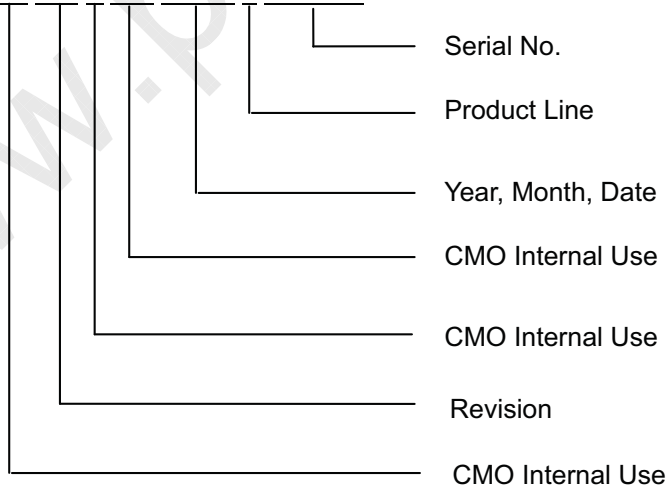
The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



(a) Model Name: V315B5-L10

(b) Revision: Rev. XX, for example: A0, A1... B1, B2... or C1, C2...etc.

(c) Serial ID: XXXXXXXYMDLNNNN



9. PACKAGING

9.1 PACKING SPECIFICATIONS

- (1) 5 LCD TV modules / 1 Box
- (2) Box dimensions : 826(L) X 376 (W) X 540 (H)
- (3) Weight :
 - a. Panel module each pcs : 5.211 kg
 - b. Panel Packing Box
 - Cushion : 0.494 kg (5 pcs per box)
 - Carton : 2.3 kg
 - Panel : 5.211 kg x 5pcs =26.055 kg
 - Panel Packing Box Total (1 Box) =28.849 kg
 - c. Total Packing weight
 - 1) For Vessel shipment Pallet (1 Pallet =6 Box or 9 Box)
 - Pallet weight : 12 kg
 - Pallet Cushion : 2.96 kg or 4.44 kg
 - Pallet Packing Total = 185.09 kg or 271.6 kg
 - 2) For Air shipment Pallet (1 Pallet =6 Box)
 - Pallet weight : 12 kg
 - Pallet Cushion : 2.96 kg
 - Pallet Packing Total =185.09 kg

9.2 PACKING METHOD

Figures 9-1 and 9-2 are the packing method

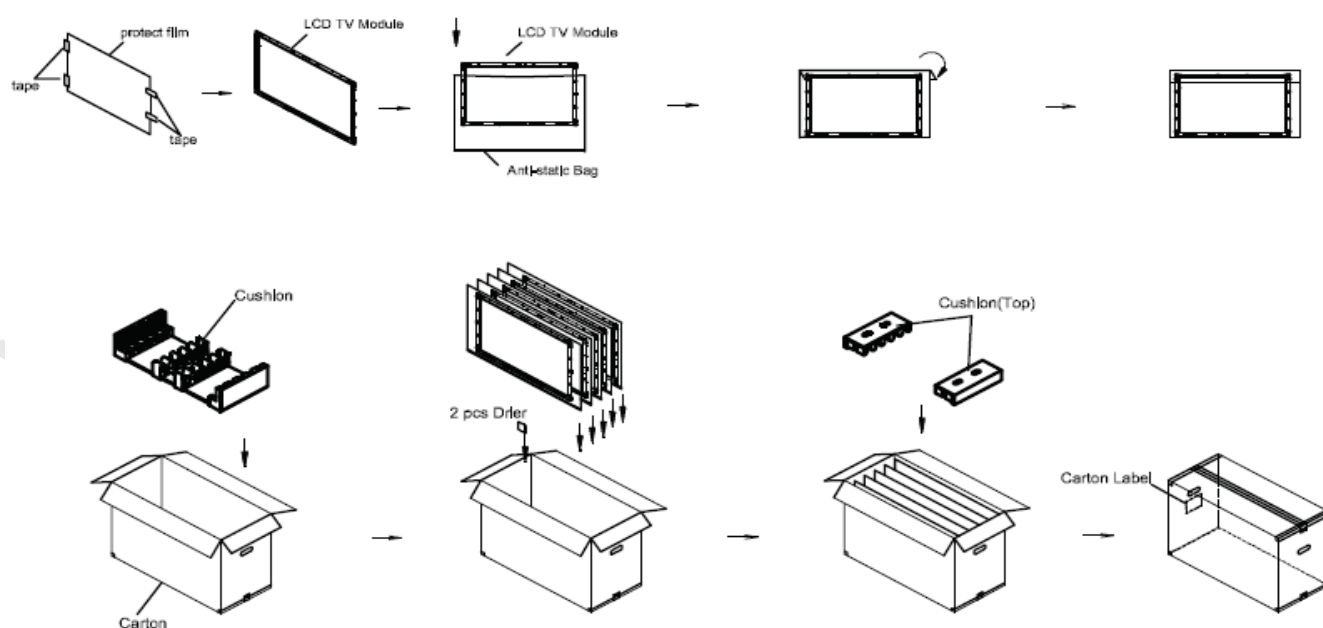
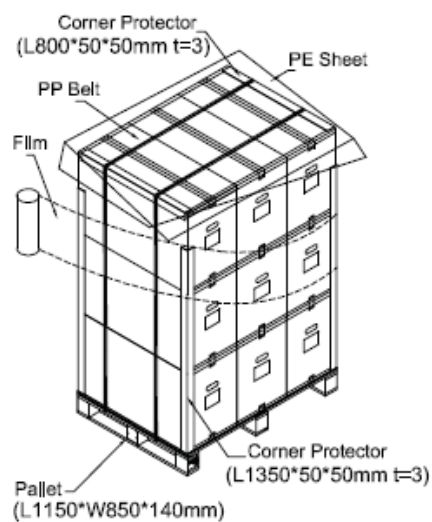


Figure.9-1 packing method

Sea / Land Transportation
(40ft Container)

Air Transportation

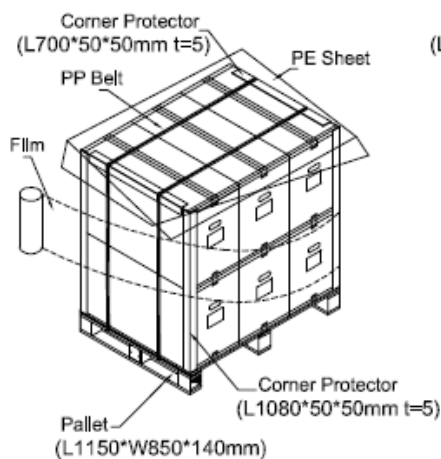
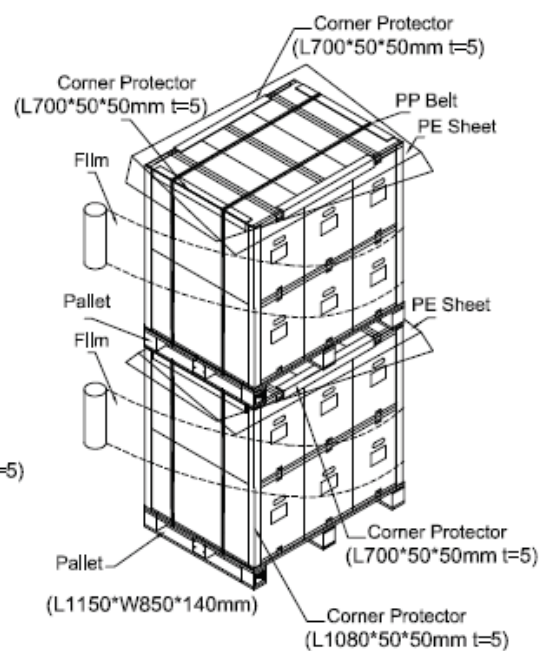
Sea / Land Transportation
(40ft HQ Container)

Figure.9-2 packing method



10. PRECAUTIONS

10.1 ASSEMBLY AND HANDLING PRECAUTIONS

- (1) Do not apply rough force such as bending or twisting to the module during assembly.
- (2) It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
- (3) Do not apply pressure or impulse to the module to prevent the damage of LCD panel and backlight.
- (4) Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.
- (5) Do not plug in or pull out the I/F connector while the module is in operation.
- (6) Do not disassemble the module.
- (7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.
- (8) Moisture can easily penetrate into LCD module and may cause the damage during operation.
- (9) High temperature or humidity may deteriorate the performance of LCD module. Please store LCD modules in the specified storage conditions.
- (10) When ambient temperature is lower than 10°C, the display quality might be reduced. For example, the response time will become slow, and the starting voltage of CCFL will be higher than that of room temperature.

10.2 SAFETY PRECAUTIONS

- (1) The startup voltage of a backlight is over 1000 Volts. It may cause an electrical shock while assembling with the inverter. Do not disassemble the module or insert anything into the backlight unit.
- (2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- (3) After the module's end of life, it is not harmful in case of normal operation and storage.

11. MECHANICAL CHARACTERISTICS

